

Proceedings of SALT 28: 233–250, 2018

Spurious NPI licensing and exhaustification*

Jon Ander Mendia

Heinrich Heine University Düsseldorf

Ethan Poole

University of California, Los Angeles

Brian Dillon

University of Massachusetts Amherst

Abstract Under certain circumstances, speakers are subject to so-called *spurious NPI licensing effects*, whereby they perceive that NPIs without a c-commanding licensor are in fact licensed and grammatical. Previous studies have all involved the presence of a licensor in a position that linearly precedes, but does not c-command the NPI. In this paper, we show that spurious NPI licensing can occur in the outright absence of a licensor, in contexts that force an exhaustive parse. We reason that at least these instances of spurious NPI licensing might be reduced to the EXH operator pragmatically “rescuing” the NPI, in the sense of Giannakidou (1998, 2006).

Keywords: negative polarity items, spurious licensing, exhaustification

1 Introduction

Negative Polarity Items (NPIs), such as *any*, *ever*, and *at all*, are expressions subject to specific licensing conditions. It is generally agreed that the licensing environment of NPIs includes Downward Entailing (DE) contexts (e.g. Fauconnier 1975; Ladusaw 1979). We assume the formulation of DE in (1) (e.g. von Stechow 1999; Homer 2012).

(1) Downward Entailment

A function f of type $\langle \alpha, \beta \rangle$ is DE iff for all x, y of type α such that $x \subseteq y$: $f(y) \subseteq f(x)$ (where “ \subseteq ” stands for cross-categorical entailment).

A characterizing feature of DE contexts is that they support set-to-subset inferences, as shown below for negation (2) and the restrictor of a universal quantifier (3).

* For helpful discussion, we thank Athulya Aravind, Seth Cable, Lyn Frazier, Vincent Homer, Stefan Keine, and audiences at SALT 28, WCCFL 36, and the University of Massachusetts Amherst.

(2) *Negation*

- a. I don't like vegetables \models I don't like carrots
- b. I like vegetables $\not\models$ I like carrots

(3) *Universal quantifier*

- a. Every student with an idea should speak up. \models Alex should speak up
- b. Some student with an idea should speak up $\not\models$ Alex should speak up

Thus, it follows that an NPI can be licensed both under the scope of negation (4) and in the restrictor of a universal quantifier (5).

(4) *Negation*

- a. I didn't like the movie **at all**.
- b. * I liked the movie **at all**.

(5) *Universal quantifier*

- a. Every student with **any** new idea on NPI licensing should speak up.
- b. * Some student with **any** new idea on NPI licensing should speak up.

What the examples in (a) have in common—and that is crucially missing from the pairs in (b)—is that they provide DE environments, which, in turn, are responsible for licensing the NPI. This is captured by the classical definition of the NPI licensing condition in (6).

(6) **NPI licensing condition**

An NPI is grammatical only if it occurs in a DE environment.

A standard way to implement the distributional restriction on NPIs has been to assume that the licensing condition is fundamentally structural. A DE environment can be taken to be a constituent (e.g. an operator) that is DE with respect to the position of the NPI. In this approach, a licensor must c-command an NPI in the syntax, wherein failure to satisfy this structural requirement leads to ungrammaticality (Ladusaw 1979). For example, in (7b), the negative quantified phrase *no topic* modifies the NP headed by the noun *assignment* such that it occupies a position from where c-command of the NPI *any* is impossible, thereby yielding ungrammaticality.

- (7) a. **No student of mine** liked **any** of my homework assignments.
- b. * The student of mine liked **any** homework assignment on **no topic**.

This simple “grammatical” theory of NPI licensing makes the clear prediction that in the absence of a c-commanding licenser, a sentence with an NPI should be ungrammatical.

However, it has been argued that this grammatical theory of NPI licensing is insufficient. A number of experimental studies have shown that, under certain circumstances, speakers are subject to so-called *spurious NPI licensing effects*, whereby they perceive that ungrammatical NPIs are in fact licensed and grammatical.¹ The relevant paradigm is given in (8). In (8a), the Neg-word *no* licenses the NPI *ever* by virtue of the structural c-commanding position of the DP that it heads. In the absence of such a Neg-word or other licenser, the sentence is ungrammatical (8c). Spuriously licensed NPIs are cases like (8b), where there is a licenser present in the sentence, but it does not c-command the NPI and thus does not meet the structural licensing condition. In sum, (8b) patterns like (8a) instead of like (8c), even though there is no accessible licenser in (8b) for the NPI.

- (8) a. *Grammatical*
 No mountains that the Swedish hikers have climbed have **ever** been taller than 5000 feet.
- b. *Spurious*
 The mountains that **no** Swedish hikers have climbed have **ever** been taller than 5000 feet.
- c. *Ungrammatical*
 The mountains that the Swedish hikers have climbed have **ever** been taller than 5000 feet.

The pattern in (8) has been widely attested under a variety of different experimental methodologies, languages, and structural configurations. It has been observed in acceptability judgment tasks (Drenhaus, Saddy & Frisch 2005; Parker & Phillips 2016; Vasisht, Brüssow, Lewis & Drenhaus 2008; Xiang, Grove & Giannakidou 2013; Yanilmaz & Drury 2018), eye-tracking (Vasisht et al. 2008), self-paced reading (Parker & Phillips 2016; Xiang, Dillon & Phillips 2006; Xiang et al. 2013), and event-related potential (ERP) studies (Drenhaus et al. 2005; Xiang, Dillon & Phillips 2009; Yanilmaz & Drury 2018). The resulting state of affairs is unexpected, as the robust empirical pattern of spurious licensing is in direct conflict with the clear predictions of the standard grammatical theory of NPIs. This raises the questions listed in (9).

¹ These effects are sometimes classified as “grammatical illusions”, though we will not use such terminology.

(9) *Main questions*

- a. What triggers the spurious licensing of NPIs?
- b. What is the interpretation of sentences with spuriously licensed NPIs?

In this paper, we provide novel empirical evidence showing that spurious NPI licensing may also occur in the *outright absence* of a legitimate overt licenser, namely in contexts that force an *exhaustive parse*. We will propose that these cases of spurious NPI licensing are tied to EXH, a covert exhaustivity operator with similar syntax and semantics to *only*. While *only* is able to license NPIs, we will contend that the NPI licensing ability of EXH cannot be straightforwardly reduced to that of *only*. We instead suggest (i) that these cases of spuriously licensed NPIs are pragmatically “rescued” by EXH, in the sense of Giannakidou (1998, 2006), and (ii) that the pragmatic account advanced by Xiang et al. (2009, 2013) for the classical cases of spurious NPI licensing, e.g. (8), can be reduced to the same kind of mechanism. Under this proposal, then, spuriously licensed NPIs are interpreted as ordinary NPIs.


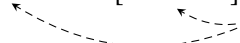
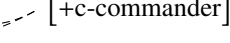

2 Previous accounts of spurious NPI licensing

Previous accounts of spurious NPI licensing effects have sought an explanation in terms of some form of intervention or interference effect. All of the documented cases of spurious NPIs involve the presence of an overt licenser in the sentence, albeit one that does not c-command the NPI. The general line of thinking goes one of two ways: the mere presence of a licenser suffices either (i) to “partially” or “superficially” license the NPI or (ii) to induce a pragmatic inference involving an implicit negation that, in turn, is responsible for the spurious licensing of the NPI. Let us consider these two approaches in turn.

2.1 Processing account

Under the first approach—which could be considered a processing account—developed by Drenhaus et al. (2005) and Vasishth et al. (2008), spurious licensing effects reflect a (superficial) syntactic licensing process engaged during the incremental parsing of NPIs. Vasishth et al. develop a fully explicit computational model that realizes this “cue-based” parsing model within ACT-R, a cognitive architecture used for modeling higher level cognition (Anderson 2007). In this parsing framework, encountering an NPI triggers a search for a licenser in memory. This search is executed in a content-addressable memory system, guided by retrieval cues that represent the features that a suitable licenser should have. If those cues match a representation in memory, it is reactivated (or *retrieved*), and the NPI is thereby

licensed. The search for a suitable licenser employs two retrieval cues, [+negative] and [+c-commander], which must match between the NPI and the licenser (10a). Spurious NPI licensing happens when a licenser bearing these two features cannot be found, but a licenser bearing only [+negative] can be. Thus, in (10b), the NPI partially matches the potential licenser embedded in the relative clause with the cue [+negative], but crucially not with [+c-commander]. This partial cue-match, combined with stochastic fluctuation of the activation of encodings in memory, means that occasionally the embedded licenser reaches the reactivation threshold and is identified as a licenser. Thus, the result of this partial match is the occasional perception that the spurious NPI is syntactically licensed.

- (10) a. *Grammatical*
 No mountains ... the Swedish hikers ... ever ...
 $\begin{bmatrix} +\text{negative} \\ +\text{c-commander} \end{bmatrix}$  $\begin{bmatrix} +\text{negative} \\ +\text{c-commander} \end{bmatrix}$
- b. *Spurious*
 The mountains ... no Swedish hikers ... ever ...
 $\begin{bmatrix} +\text{c-commander} \end{bmatrix}$ $\begin{bmatrix} +\text{negative} \end{bmatrix}$ $\begin{bmatrix} +\text{negative} \\ +\text{c-commander} \end{bmatrix}$
 
- c. *Ungrammatical*
 The mountains ... the Swedish hikers ... ever ...
 $\begin{bmatrix} +\text{c-commander} \end{bmatrix}$  $\begin{bmatrix} +\text{negative} \\ +\text{c-commander} \end{bmatrix}$

There are several problems with this cue-based parsing approach. First, relational cues such as [+c-commander] are not straightforward to code in a cue-based retrieval architecture, because they do not represent the features of a *single* encoding, but rather the structural relationship that holds between *two* encodings (see [Vasishth et al. 2008](#) and [Kush, Lidz & Phillips 2015](#) for discussion). Second, the role of the two cues is necessarily asymmetric: only one type of partial match leads to spurious licensing, viz. [+negative], but not the other type, viz. [+c-commander]. It is not well understood why [+negative] has this privileged status. Third, NPIs have been reported to be more prone to spurious effects than other formally similar dependencies, e.g. reflexives, in similar contexts; such between-construction differences are, however, unexpected on an account that attributes the effects to the memory architecture of the parser ([Xiang et al. 2009](#)). Last, because this parsing model identifies incremental licensing of NPIs with search for a morphologically negative expression accessible in memory, it does not realize the right grammatical constraints on NPI licensing. That is, it does not provide a clear model for how NPIs are incre-

mentally licensed in DE contexts, it does not predict licensing differences between the restrictor and the scope of a universal quantifier, amongst other problems (Xiang et al. 2009). Thus, while this account correctly predicts spuriously licensed NPIs, it has been difficult to integrate the cue-based parsing approach to these effects with the standard grammatical account of NPIs, where the structural conditions on the licenser go hand-in-hand with their specific semantic (logical) properties.

2.2 Pragmatic account

In response to some of these challenges, Xiang et al. (2009) offer a second hypothesis for the source of spurious NPI licensing effects that attributes them to a pragmatic inference. On their view, the negative quantifier embedded inside the restrictive relative clause prompts an inference about the complement set of the relevant referent. For instance, in the case of (8b) above, the referent of the DP *the mountains that no Swedish hikers have climbed* invites an inference about the properties that may or may not hold of its complement set, i.e. *the mountains that some Swedish climbers have indeed climbed*. Now, given a set *A*, a sentence of the form *the As P* may induce the inference that *the \bar{A} s not P*. In this case, for an utterance like *the mountains that no Swedish climbers have climbed are P*, it is possible to deduce that it is not the case that the mountains that have indeed been climbed by Swedish climbers are *not P*. This pragmatic inference involves an implicit negation of the properties that may be true of the complement of the referent set, and it is this implicit negation that has been claimed to interfere with the NPI licensing process, leading to spurious licensing (Xiang et al. 2009, 2013).

3 Experiment

On the pragmatic account of spurious NPI licensing, it is conceivable that an overt non-c-commanding licenser is, strictly speaking, not necessary for the effect. As the source of the spurious effect is a pragmatic inference and not the licenser directly, the right kind of inference could in principle come about from means other than an NPI licenser. To test this hypothesis, we conducted a speeded-acceptability judgement task. The results show that, indeed, spurious NPI licensing can occur in the outright absence of an overt licenser.

The experiment focuses on contexts involving *shortfall* (used by Moxey 2006 to investigate complement-set reference): the expectation of what the reference set of a previously mentioned NP should be, particularly when there is a deficit between what is expected and what is fact. These shortfall contexts provide discourse pressure towards an *exhaustive parse*. To illustrate, consider (11), where the first sentence creates an expectation to continue talking about all of the plants, an ex-

pectation that is not met in the second sentence.

- (11) Whenever the summer is really dry, Susy expects all of her plants to die.
This year, a small number of the plants have died.

Not parsing the second sentence exhaustively violates the Maxim of Quantity, which is difficult to cancel, as shown by the oddness of the follow-up in (12).

- (12) # ... In fact, all of them have.

3.1 Method

Materials · The experimental materials consisted of 24 items, each made up of a context sentence and a target sentence. The items manipulated two factors, for a total of four conditions: (i) the presence of the NPI *ever* ([±EVER]) and (ii) the obligatoriness of exhaustive parsing via shortfall ([±EXH]). A sample experimental item is given in (13).

- (13) a. [+EXH], [±EVER]
Whenever the summer is really dry, Susy expects **all** of her plants to die. However, a small number of the plants have {**ever** / \emptyset } died.
b. [−EXH], [±EVER]
Whenever the summer is really rainy, Susy expects **none** of her plants to die. However, a small number of the plants have {**ever** / \emptyset } died.

The 24 experimental sentences were interspersed with 24 fillers. Filler accuracy was used to measure participant attention. Half of the fillers were uncontroversially grammatical, some of which included NPIs c-commanded by an overt licenser. The other half of the fillers were uncontroversially ungrammatical, containing person and number mismatches, voice mismatch under ellipsis, and presupposition failure.

Participants · The experiment included 72 participants, recruited via Amazon Mechanical Turk. Participants were native speakers of American English and naïve to the purpose of the experiment. Each participant received a compensation of \$1.

Procedure · The experiment was conducted online using the online experimental platform Ibex Farm (Drummond 2013), and it employed a speeded-acceptability judgement task. Each trial proceeded as follows:

- i. The participant read a context sentence that manipulated shortfall and was displayed all at once. They had as much time as they needed to read the sentence and pressed the spacebar to proceed.

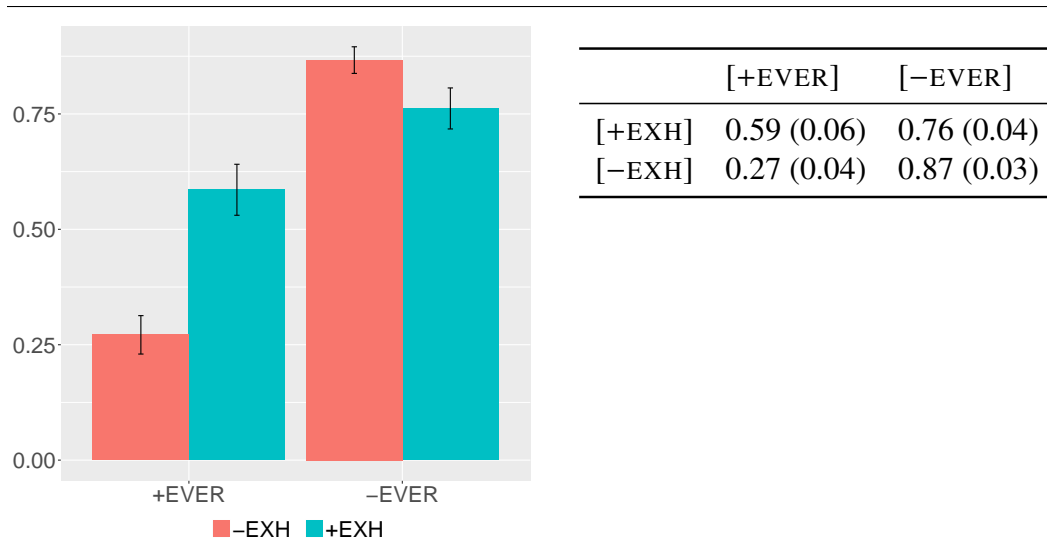


Figure 1 Proportion of natural responses and standard errors by condition.

- ii. The participant was presented a target sentence with or without *ever* in a rapid word-by-word display. Each word was displayed for $225\text{ms} + 15\text{ms} * l$, where l is the length of the word in characters.
- iii. The participant was asked to judge the target sentence. They answered VERY NATURAL by keying ‘f’ or NOT SO NATURAL by keying ‘j’.

There was a mandatory break of 10 seconds in the middle of the experiment, after 24 trials. Overall, the experiment took approximately 30 minutes. A progress bar was displayed throughout the experiment.

Items were arranged in a Latin Square design of four lists such that each list contained one instance of every item and the four conditions of each item appeared on separate lists. List assignment and order of presentation were randomized for each participant.

3.2 Results

Of the 72 participants, those with an overall accuracy less than 70% on the fillers were excluded from the data analysis; this step eliminated 37 participants so that 35 participants remained. The proportion of ‘natural’ responses by condition are provided in Figure 1.

We analyzed the results using a logistic mixed effects model with [EXH] and [EVER] as fixed effects and full random effects structure for subjects and items. The

proportion of ‘natural’ responses was lower in the [+EVER] condition ($z = -8.6, p < 0.05$), and there was no main effect of [EXH] ($z = 0.7, p = 0.5$). There was an interaction between the two factors ($z = 6.1, p < 0.05$). To investigate this interaction, we ran a second model that nested the factor [EXH] under the levels of [EVER] and retained the full random effects structure of the original model. This model revealed a crossover interaction: in [–EVER], the presence of shortfall ([+EXH]) degraded a sentence ($z = -3.1, p < 0.05$); in [+EVER], the presence of shortfall improved the sentence ($z = 5.2, p < 0.05$).

4 Discussion

The results of the experiment in the previous section show that our expectations were met: shortfall cases improve acceptance rates of NPIs in the absence of an overt licenser. Notably, these results are incompatible with the processing account of spurious NPI licensing because there is no overt licenser that *could* be retrieved from memory in the incremental processing of NPIs. We attribute the improvement in the acceptability of unlicensed NPIs to the presence of the covert exhaustivity operator EXH, which is obligatorily inserted in shortfall contexts to render them exhaustive. In what follows, we elaborate on how EXH is able to “rescue” NPIs at the cost of lower acceptability (e.g. *vis-à-vis* NPIs licensed by negation or *only*).

The ensuing question is clear: what makes EXH a good “spurious” NPI licenser? The obvious place to look first is the semantic similarity that EXH bears to the exclusive particle *only*, a well-known NPI-licenser (14).²

- (14) a. $\llbracket \text{only} \rrbracket^w = \lambda C_{\langle st, t \rangle} \cdot \lambda p_{\langle st, t \rangle} : p(w) \cdot \forall q \in C(p)[q(w) \rightarrow p \subseteq q]$
 b. $\llbracket \text{EXH} \rrbracket^w = \lambda C_{\langle st, t \rangle} \cdot \lambda p_{\langle st, t \rangle} \cdot p(w) \wedge \forall q \in C(p)[q(w) \rightarrow p \subseteq q]$

The only difference between the two operators is that while *only* presupposes the truth of its prejacent, EXH instead asserts it (for discussion, see Chierchia 2013: ch. 4). This difference is empirically well motivated. For example, B’s reply to A’s statement in (15) is interpreted exhaustively, and it does not presuppose anything special (capital letters express focal prominence; example from Chierchia 2013: 33).

- (15) A: John is fond of every new student.
 B: No, he is fond of PAUL and SUE.

In addition to this difference being empirically well-motivated, it comes with an important consequence for the purposes of NPI licensing: neither of the two in (14) are DE. It is controversial what property (or properties) of *only* make it a good NPI

² We follow the convention of writing presuppositions as domain restrictions on partial functions.

licensor. Thus, to understand whether (and, if so, how) EXH is able to increase the acceptability of otherwise unlicensed NPIs by virtue of its semantic similarity to *only*, one must first understand what exactly makes *only* a licit NPI licensor.

4.1 Licensing NPIs with *only*

Throughout the paper, we have been assuming that the NPI licensing condition is (6), repeated below.

(6) NPI licensing condition

An NPI is grammatical only if it occurs in a DE environment.

As discussed in section 1, this condition captures the NPI licensing capacity of most licensors, including negation and the scope of universal quantifiers. However, it is well-known that the exclusive focus particle *only* is also able to license NPIs (16), an observation that goes back to Klima 1964: 311.

(16) **Only** young writers ever accept suggestions with **any** sincerity.

The challenge posed by *only* is that it is able to license NPIs, but it is not DE. For example, as shown in (17a), *only* does not support set-to-subset inferences, unlike negation (17b).

- (17) a. Only Sam likes vegetables \neq Only Sam likes carrots
 b. I don't like vegetables \models I don't like carrots

As such, the NPI licensing capacity of *only* does not fall under the purview of (6); this condition is too strong. In the literature, there are two main solutions to this problem: weakening the licensing condition (von Fintel 1999) and introducing a secondary mode of NPI licensing (Giannakidou 1998, 2006). Let us consider each in turn.

4.1.1 Strawson Downward Entailment

Von Fintel (1999) proposes to weaken the NPI licensing condition in (6) by factoring in the presuppositional content of *only* to the inferential process that allows set-to-subset entailments. This is done by introducing the notion of Strawson Downward Entailment (SDE) in (18), a minimal modification of (1), and accordingly modifying the licensing condition of NPIs to be about SDE (19).

(18) Strawson-DE

A function f of type $\langle \alpha, \beta \rangle$ is SDE iff for all x, y of type α such that $f(x)$ is defined and $x \subseteq y$: $f(y) \subseteq f(x)$.

(19) **Modified NPI licensing condition**

An NPI is acceptable only if it occurs in a SDE environment.

The virtue of relying on SDE to define (19) is that *only* is effectively DE if the presupposition of its prejacent is satisfied. This is illustrated in the reasoning in (20).

(20)	Carrots are vegetables	$x \subseteq y$
	Sam ate carrots	$f(x)$ is defined
	Only Sam ate vegetables	$f(y)$
	<u>∴ Only Sam ate carrots</u>	$\therefore f(x)$

The SDE account of *only* crucially exploits the idea that the prejacent of *only* is presupposed, a matter that has been the object of considerable debate (for dissenting voices, see Atlas 1993, 1996; Horn 1996; Giannakidou 2006, a.o.). Assuming that this is the right assessment, however, it is difficult to see how this position may help us understand the spurious licensing properties of EXH, since by *asserting* the prejacent, EXH is neither DE nor SDE, but merely nonmonotonic (21).

- (21) a. EXH C [FOUR students came]. \Leftrightarrow Exactly four students came.
b. \neq Exactly three students came.

Not only is EXH nonmonotonic, but its treatment as being nonpresuppositional seems to be on the right track, at least with respect to NPI licensing in canonical cases: unlike *only*, EXH cannot license NPIs in simple sentences (22).

- (22) a. Only Sam ever visited us.
b. * EXH SAM ever visited us.

As such, under an account where *only* licenses NPIs because it is SDE, EXH is not expected to license NPIs.³ That EXH is a spurious licenser, then, must be accounted for independently of its semantic similarities to *only*.

³ One could still posit a covert operator that is exactly like *only*. This is to admit, in other words, that there is a variant of EXH that presupposes its prejacent, rather than asserting it. Notice, however, that we should not burden this covert *only* with the work of ordinary EXH. Assuming that EXH is freely insertable (minimally) at all propositional nodes, allowing for the same flexibility in the case of covert *only* would blur the distinction between presupposition and assertion in ways that would be difficult to assess. Alternatively, it could be the case that an overt *only* is inserted at LF, resulting in effectively licensing the NPI in the ordinary way. In either case, the two proposals would need to be supplemented by a theory of when exactly this repair mechanism should be deployed, since unlicensed NPIs do in fact exist.

4.1.2 Nonveridicality and rescuing

Giannakidou (1998, 2006) proposes a different explanation of the NPI licensing capacity of *only*. Following the hierarchy of negative operators in Zwarts (1996), she argues for an additional mode of NPI licensing, which she calls “rescuing” (23).

- (23) **Rescuing by non-veridicality** [adapted from Giannakidou 2006]
 An NPI α can be rescued in sentence S , if (i) the global context C of S makes a proposition S available which contains a non-veridical expression β , and (ii) α is in the scope of β in S .

According to (23), the relation between the nonveridical expression (e.g. negation) and the NPI α need only hold in the alternative proposition S' , not in S itself. That is, an NPI can be rescued by virtue of it being licensed in some alternative S' that is made available in the global context of the assertion.

This global context includes not only the assertive content of the proposition, but also its presuppositions and implicatures (cf. the “assertoric inertia” of Horn 2002, whereby some aspect of meaning becomes assertorically inert, and some other aspect becomes salient). This mechanism was originally developed to account for NPI licensing with emotive verbs (Giannakidou 1998). Emotive verbs give rise to a negative inference that has been characterized either as a presupposition (Baker 1970) or as an implicature (Linebarger 1980). Giannakidou argues that this negative inference suffices to “rescue” the NPI. For example, *any* in (24a) is rescued by the fact that it presupposes/implicates (24b), where *any* is under the scope of a negative operator; as such, *any* is fully licensed in (24a).

- (24) a. Sam is surprised that [Alex has **any** friends]_p.
 b. Sam did **not** expect that [Alex has **any** friends]_p.

Thus, this rescuing mechanism relies on the NPI being able to access a pragmatic level of representation, as the negative meaning does not necessarily arise from any logical property of the assertion itself.

In the case of *only*, Giannakidou proposes that the nonveridical proposition is an entailment of the sentence (i.e. it is part of the assertion), which suffices to rescue the NPI despite failing to contribute an SDE or DE environment. By the same token, EXH would qualify as a good NPI rescuer, to which we turn in the following section.

4.2 Spurious NPI licensing as rescuing by EXH

The two theories of the NPI licensing capacity of *only* reviewed in the previous subsection make divergent predictions with respect to the NPI licensing capacity

of EXH. While the SDE account predicts that EXH should not be a good NPI licenser—at least not on the basis of its semantic similarity with *only*—, the non-veridicality account developed by Giannakidou predicts that, when it comes to NPI rescuing, *only* and EXH should go hand-in-hand. Prima facie, our results are at odds with both predictions.

We contend that our results lend support to a general view of NPI licensing where the SDE-based licensing condition in (19) is essentially correct, but that there exists a second, pragmatic (or indirect) way of rescuing otherwise unlicensed NPIs (cf. Linebarger 1980, Giannakidou 1998, Xiang et al. 2009, a.o.).

Recall that our shortfall scenarios are such that they require an exhaustive parse of the target sentence. Failing to do so and accepting a nonexhaustive interpretation would lead to an incoherent discourse move. The main characteristic of shortfall contexts, e.g. in (25), is that they introduce a referent set (e.g. *all the plants*), followed by an immediate predication about a proper subset of that set (e.g. *a small number of the plants*). Assuming that all the standard pragmatic principles hold—i.e. the listener assumes that the speaker is being maximally informative, etc.—a scalar implicature *must* be calculated; in this case, an inference that the target sentence is about *a small number of the plants, but not all of the plants*. In the case of shortfall, not doing so would lead to an incoherent discourse.

(25) Whenever the summer is really dry, Susy expects all of the plants in her garden to die. However, this summer a small number of the plants have died.

a. # In fact, all of them have.

The oddness of the follow-up in (25a) is due to the following: The first sentence sets up the expectation that the discourse will be about *all the plants*. When this expectation is not met in the second sentence, the parser is then forced to insert an exhaustive operator, i.e. EXH, in the second sentence. This in turn renders the last sentence in the series a contradiction.

In the presence of an NPI such as *ever*, we submit that the role of EXH is double: it not only rescues the discourse coherence of the follow-up sentence, but it also provides an “assertoric inertia” that sanctions rescuing the NPI (Horn 2002).⁴ More concretely, we understand this assertoric inertia as making available an alternative proposition identical to the assertion but where *only* takes the place of EXH.

⁴ The notion of rescuing we are considering here departs slightly from that of Giannakidou (2006). In her account, rescuing is possible under non-veridical operators. Since *only* is veridical (*only p* entails *p*), she concludes that *only*’s veridicality must be somehow “bleached”. Instead, we endorse the more conservative view that the mechanisms allowing an operator to rescue an NPI must be the same as those licensing it; i.e., it must be a (S)DE operator.

Since, by virtue of being a licit licensor, *only* can license the NPI in the alternative proposition, we can say that the NPI in the utterance itself is rescued by EXH. The rescuing process, however, comes at a cost to which ordinary NPI licensing is not subject. This is reflected in the varying acceptability of the *only* vs. EXH variants in (26): while the *only* version is intuitively grammatical, our results find that rescuing by EXH drops the acceptability rates to 59%.

- (26) Whenever the summer is really dry, Susy expects all of the plants in her garden to die. However,...
- a. only a small number of the plants have ever died.
 - b. EXH a small number of the plants have ever died.

The general pattern that emerges is one where shortfall contexts (our [+EXH] condition) drop acceptability across the board, but despite this lowered acceptability, there is only a 17% difference in acceptability rates for [-/ +EVER] conditions. This contrasts with the 50% difference in acceptability rates observed for the no shortfall ([-EXH]) conditions. We take this to indicate that shortfall contexts are such that they bring saliency to the alternative proposition containing *only*, thereby facilitating rescuing the NPI.

Thus, assuming that *only* is an ordinary NPI licensor (following the SDE account, for instance), we can draw a line between “licensing” an NPI and “rescuing” an NPI that accounts for the results reported in section 3.2, while shedding light on the contrast between *only* and EXH.

This type of rescuing is moreover very close in spirit to the pragmatic, inference-based NPI licensing mechanism advocated for by Xiang et al. (2009, 2013) to account for the classical cases of spurious NPI licensing, e.g. (8). As discussed in section 2.2, these authors argue that in parsing a sentence like *The mountains that no Swedish hikers have climbed P*, speakers may draw a negative inference about a complement set, e.g. *the mountains that Swedish hikers have climbed not P*. In fact, it seems that restrictive modifiers, such as restrictive relative clauses, generally invite such negative inferences about the complement set of a referent (see Altmann & Steedman 1988; Sedivy, Tanenhaus, Chambers & Carlson 1999, a.o.).

Most previous studies on spurious NPI licensing thus far have used restrictive relative clauses to host an intervening licensor. We agree with Xiang et al. (2009, 2013) that it is plausible that restrictive relative clauses facilitate the triggering of such negative inferences about complement sets.

Notably, the experiment presented in this paper does not use restrictive modifiers, nor does it have any type of intervening licensor. Notwithstanding, we believe that the same explanation can apply to shortfall contexts as well. What classical spurious NPI cases and the shortfall cases have in common is that they invoke a

negative inference that *would* license an NPI in its scope. The two may both then constitute cases of rescuing, as defined in (23).⁵

5 Conclusion

In this paper, we have provided the novel empirical contribution that spurious NPI licensing effects can occur in the outright absence of an overt licenser, in contexts that force an exhaustive parse. These results are *prima facie* incompatible with the cue-retrieval processing account of spurious NPI licensing. We have argued that spurious NPI licensing effects instead involve pragmatic “rescuing” in the sense of Giannakidou (1998, 2006).

There are several open questions for future research; we will highlight two here. In our study, the role of shortfall proved crucial to bring saliency to an alternative proposition containing *only*, and so rescue the NPI. This alternative proposition was made available by EXH, which, by itself does not suffice to rescue and NPI; see (22). We hypothesize that one decisive factor in shortfall contexts is that they force an exhaustive parse of the sentence, rendering it a good environment for rescuing NPIs. Thus, identifying exactly the aspects of shortfall that make EXH a good rescuer is a question that we are actively exploring in follow-up experiments. The second question concerns instances where NPIs may occur in the scope of a nonmonotonic quantifier, like *exactly* in (27) (first observed by Linebarger 1980), which appear to be context-sensitive.

- (27) a. Exactly two people ever read that dissertation.
- b. # Exactly four hundred people ever read that dissertation.

Crnič (2014) has recently argued that cases like (27) involve genuine NPI licensing, under a modified theory of NPI licensing that (i) employs a covert operator EVEN with identical semantics to its overt counterpart, (ii) whose presupposition is sensitive to contextually available information. However, the pragmatic approach to spurious NPI licensing raises the question of whether (27) instead involves pragmatic rescuing as described here, such that (27) should be added to the repertoire of spurious NPI licensing effects. If true, then under experimental conditions we would expect (27), even in felicitous cases such as (27a), to have lower acceptability rates than NPIs licensed via (S)DE.

⁵ To be clear, we are only applying the notion of rescuing to cases of spurious licensing, i.e. to cases where the acceptability rates of sentences with NPIs are not as high as those of sentences with fully licensed NPIs. Thus, we depart from Giannakidou (1998, 2006) in that we do *not* assume that *only* also rescues (rather than licenses) NPIs. For us, rescuing is a pragmatic repair strategy that comes at cost, and that cost should be detectable in various ways; see section 2.

References

- Altmann, Gerry & Mark Steedman. 1988. Interaction with context during human sentence processing. *Cognition* 30. 191–238. doi:[10.1016/0010-0277\(88\)90020-0](https://doi.org/10.1016/0010-0277(88)90020-0).
- Anderson, John R. 2007. *How can the Human Mind Occur in the Physical Universe?*. New York: Oxford University Press.
- Atlas, Jay David. 1993. The importance of being ‘only’: Testing the neo-Gricean versus neo-entailment paradigms. *Journal of Semantics* 10. 301–318. doi:[10.1093/jos/10.4.301](https://doi.org/10.1093/jos/10.4.301).
- Atlas, Jay David. 1996. ‘Only’ noun phrases, pseudo-negative quantifiers, negative polarity items, and monotonicity. *Journal of Semantics* 13. 265–328. doi:[10.1093/jos/13.4.265](https://doi.org/10.1093/jos/13.4.265).
- Baker, Carl Leroy. 1970. Double negatives. *Linguistic Inquiry* 1. 169–186.
- Chierchia, Gennaro. 2013. *Logic in Grammar: Polarity, Free Choice, and Intervention*. Oxford University Press.
- Crnič, Luka. 2014. Non-monotonicity in NPI licensing. *Natural Language Semantics* 22(2). 169–217. doi:[10.1007/s11050-014-9104-6](https://doi.org/10.1007/s11050-014-9104-6).
- Drenhaus, Heiner, Douglas Saddy & Stefan Frisch. 2005. Processing negative polarity items: When negation comes through the backdoor. In Stephan Kepser & Marga Reis (eds.), *Linguistic evidence: Empirical, theoretical, and computational perspectives*, 145–165. Berlin: Mouton de Gruyter.
- Drummond, Alex. 2013. Ibex Farm (version 0.3) [software].
- Fauconnier, Gilles. 1975. Pragmatic scales and logical structure. *Linguistic Inquiry* 6. 353–376.
- von Fintel, Kai. 1999. NPI licensing, strawson entailment, and context dependency. *Journal of Semantics* 16. 97–148. doi:[10.1093/jos/16.2.97](https://doi.org/10.1093/jos/16.2.97).
- Giannakidou, Anastasia. 1998. *Polarity Sensitivity as (Non)veridicality*. Amsterdam: John Benjamins Publishing Company.
- Giannakidou, Anastasia. 2006. *Only*, emotive factive verbs, and the dual nature of polarity dependency. *Language* 82. 575–603. doi:[10.1353/lan.2006.0136](https://doi.org/10.1353/lan.2006.0136).
- Homer, Vincent. 2012. Domains of polarity items. *Journal of Semantics*, accepted with minor revisions.
- Horn, Laurence R. 1996. Exclusive company: *Only* and the dynamics of vertical inference. *Journal of Semantics* 13. 1–40. doi:[10.1093/jos/13.1.1](https://doi.org/10.1093/jos/13.1.1).
- Horn, Laurence R. 2002. Assertoric inertia and NPI-licensing. In *Chicago Linguistic Society (CLS)*, vol. 38 2, 55–82.
- Klima, Edward S. 1964. Negation in English. In Jerry Fodor & Jerrold Katz (eds.), *The structure of language*, Prentice Hall.
- Kush, Dave, Jeffrey Lidz & Colin Phillips. 2015. Relation-sensitive retrieval: Ev-

- idence from bound variable pronouns. *Journal of Memory and Language* 82. 18–40. doi:[10.1016/j.jml.2015.02.003](https://doi.org/10.1016/j.jml.2015.02.003).
- Ladusaw, William A. 1979. *Polarity sensitivity as inherent scope relations*. Austin, TX: University of Texas dissertation.
- Linebarger, Marcia C. 1980. *The grammar of negative polarity*. Massachusetts: MIT dissertation.
- Moxey, Linda. 2006. Effects of what is expected on the focussing properties of quantifiers: A test of the presupposition-denial account. *Journal of Memory and Language* 55. 422–439. doi:[10.1016/j.jml.2006.05.006](https://doi.org/10.1016/j.jml.2006.05.006).
- Parker, Daniel & Colin Phillips. 2016. Negative polarity illusions and the format of hierarchical encodings in memory. *Cognition* 157. 321–339. doi:[10.1016/j.cognition.2016.08.016](https://doi.org/10.1016/j.cognition.2016.08.016).
- Sedivy, J. C., M. K. Tanenhaus, C. G. Chambers & G.N. Carlson. 1999. Achieving incremental semantic interpretation through contextual interpretation. *Cognition* 71. 109–147. doi:[10.1016/S0010-0277\(99\)00025-6](https://doi.org/10.1016/S0010-0277(99)00025-6).
- Vasishth, Shravan, Sven Brüssow, Richard Lewis & Heiner Drenhaus. 2008. Processing polarity: How the ungrammatical intrudes on the grammatical. *Cognitive Science* 32. 685–712. doi:[10.1080/03640210802066865](https://doi.org/10.1080/03640210802066865).
- Xiang, Ming, Brian Dillon & Colin Phillips. 2006. Testing the strength of the spurious licensing effect for negative polarity items. Talk given at the 19th Annual CUNY Conference on Human Sentence Processing.
- Xiang, Ming, Brian Dillon & Colin Phillips. 2009. Illusory licensing effects across dependency types: ERP evidence. *Brain & Language* 108. 40–55. doi:[10.1016/j.bandl.2008.10.002](https://doi.org/10.1016/j.bandl.2008.10.002).
- Xiang, Ming, Julian Grove & Anastasia Giannakidou. 2013. Dependency-dependent interference: NPI interference, agreement attraction, and global pragmatic inferences. *Frontiers in Psychology* 4. 708. doi:[10.3389/fpsyg.2013.00708](https://doi.org/10.3389/fpsyg.2013.00708).
- Yanilmaz, Aydogan & John E. Drury. 2018. Prospective NPI licensing and intrusion in Turkish. *Language, Cognition and Neuroscience* 33(1). 111–138. doi:[10.1080/23273798.2017.1371779](https://doi.org/10.1080/23273798.2017.1371779).
- Zwarts, F. 1996. A hierarchy of negative expressions. In H Wansing (ed.), *Negation: a notion in focus*, 169–194. de Gruyter.

Mendia, Poole & Dillon

Jon Ander Mendia
Department of Linguistics
Gebäude 24.53, Raum 00.87
Heinrich-Heine-Universität Düsseldorf
Universitätsstraße 1
40225 Düsseldorf, Germany
mendia@hhu.de

Brian Dillon
Department of Linguistics
N408 Integrative Learning Center
University of Massachusetts Amherst
650 North Pleasant Street
Amherst, MA 01003
brian@linguist.umass.edu

Ethan Poole
Department of Linguistics
University of California, Los Angeles
3125 Campbell Hall
Los Angeles, CA 90095
epoole@ucla.edu